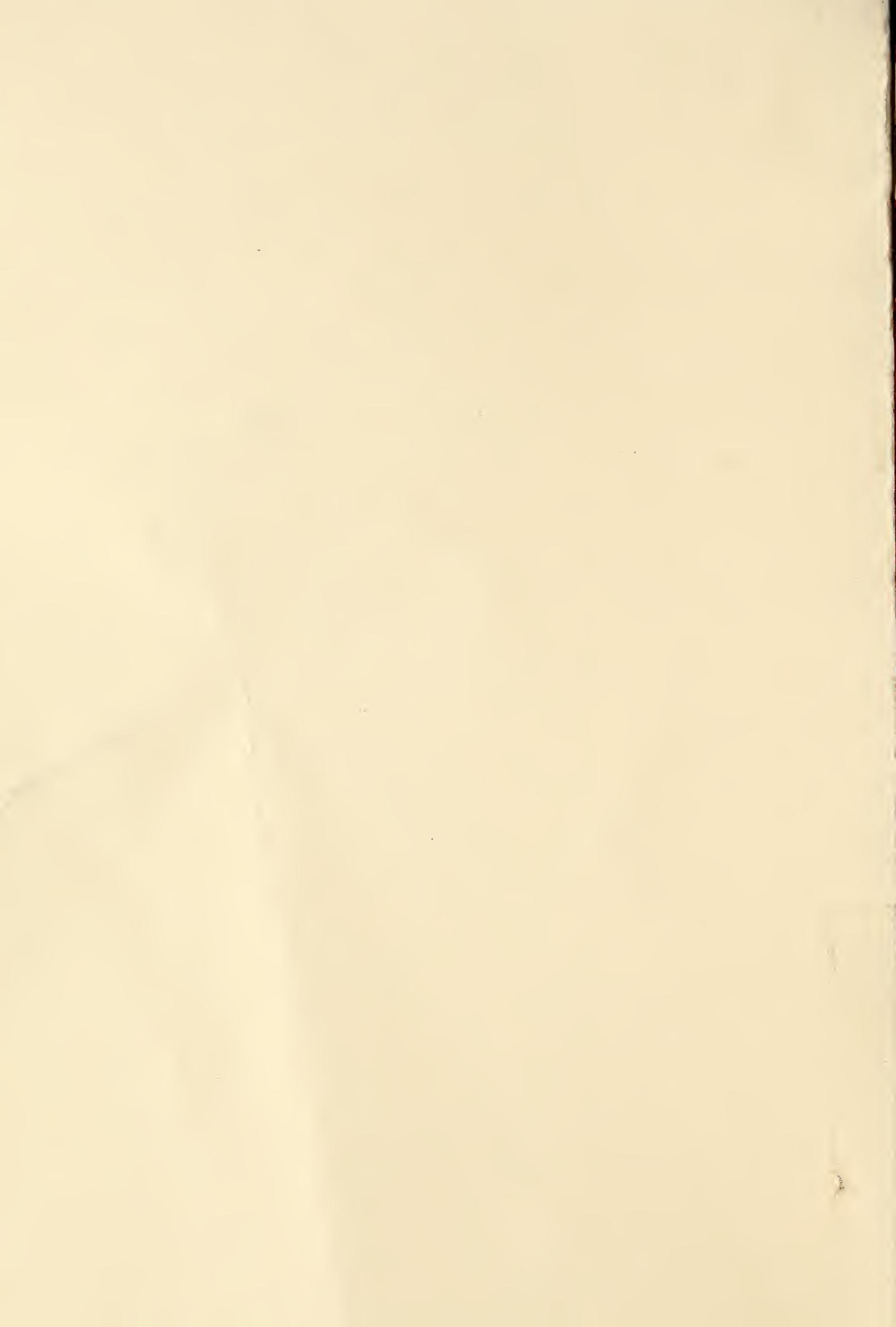


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THE RIBES OF THE INLAND EMPIRE

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BY

STEPHEN N. WYCKOFF.

THE RIBES OF THE INLAND EMPIRE
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The key and descriptions of the Ribes and the rusts on Ribes which are given here are intended for the use of blister rust men working in the Inland Empire. For the present the Inland Empire is considered as comprising that portion of Montana west of the 111th parallel of longitude, all of Idaho, and Pend Oreille, Stevens, Spokane, Whitman, Columbia, Garfield, and Asotin Counties of Washington.

Until a few years ago currants and gooseberries were both included in the genus Ribes under the family Saxifragaceae. But according to our present knowledge of botanical relationships the old genus Ribes is considered as the family Grossulariaceae, and is divided into two general Ribes, or currants, and Grossularia, or gooseberries. For the sake of convenience and brevity, the term Ribes is still used in blister rust work to designate both currants and gooseberries collectively. Used in this looser sense the term Ribes is synonymous with the family name of Grossulariaceae.

The Grossulariaceae, or currants and gooseberries, are shrubs varying in height from $1\frac{1}{2}$ to 10 feet. A majority of the species have nearly erect stems, while a few grow prostrate on the ground or have their stems rising obliquely. All of the gooseberries and two of the currants have strong, sharp spines at the nodes, or joints of the stems and branches, and often have more numerous but weaker bristles between the nodes. The leaves are always alternate,

that is, there is never more than one leaf twig or cluster starting from one place on a stem. The leaves are palmately veined, that is, with several large veins starting from the base of the leaf, and are more or less palmately lobed, or divided. In addition to the lobes, or larger divisions, the margins are more or less finely cut into teeth.

Either or both of the leaf surfaces and also the fruit may bear certain appendages which are of importance in distinguishing between the various species. These appendages are:

1. HAIRS (pubescence). These are practically always whitish in color, and may be sparse or dense, coarse or fine, and straight or curled.

2. RESIN-DOTS. (These are glands without stalks, or sessile glands.) They appear as small, round, flat dots, yellowish or reddish-brown in color, very slightly if at all raised above the surface of the leaf, and with a small depression in the center. They are composed of a semi-transparent shining secretion, somewhat resembling amber.

3. STALKED GLANDS. These are rather like very stout hairs except that they bear a small round knob at the tip. They vary greatly in size, in the length of the stalk, and in color. The stalked glands on the leaves of *Grossularia cognata* and *G. irrigua* are so small that they can often be seen only with a hand-lens. Those occurring on the fruit of *Ribes lacustre* and *R. montigenum* are very long-stalked, with the weak stalks often curved. The color of the stalked glands often varies with the age of the leaf or fruits on which they are borne.

The fruit are borne several to many in a slender cluster which may stand erect or droop. This form of cluster (raceme) consists of a central or common fruit-stalk (peduncle or rachis) from which small individual fruit-stalks (pedicels) arise, each of which bears a single fruit. Ribes fruit are round or sometimes oval, and vary considerably in size and color. They may bear hairs, resin-dots, or stalked glands, similar in form to those found on the leaves. In certain species they are also covered with a whitish powdery substance, known as the bloom. The flowers are persistent, that is, they remain in a withered condition at the tip of the fruit. These persistent flowers may be small, open, and spreading directly from the fruit, or they may be tubular, with the lobes spreading above the tube.

It is customary to think of gooseberry plants as being spiny, and currant plants as being spineless. This distinction, however, will not always hold. *R. lacustre* and *R. montigenum*, the former a very common species in the Inland Empire, are currants that are very spiny, while *G. inermis*, a typical gooseberry, has only a few very inconspicuous spines. In such cases as these, it is only by an examination of the flowers or fruit that the true relationship of the plant can be determined.

The location of the joint at which the fruit breaks off from the common fruit-stalk provides a sure means of distinguishing between currants and gooseberries. If ripe gooseberry fruits are picked, or if old fruits are found on the ground beneath the bush, they almost invariably have the individual fruit-stalk attached to the fruit.

That is, the joint or break naturally occurs between the individual fruit-stalk and the common fruit-stalk, and not between the individual fruit-stalk and the fruit. On the other hand, if currant fruits are picked, or found on the ground, they very rarely have the individual fruit-stalks still attached. In this case the break naturally occurs between the individual fruit-stalk and the fruit.

KEY TO THE RIBES OF THE INLAND EMPIRE

1. Plants without spines on the stems and branches.
 - A. Leaves with numerous yellow or reddish-brown resin-dots on the lower surfaces.
 1. Fruit bearing resin-dots. Plants widely distributed over the Inland Empire, growing along streams 1. R. petiolare.
 2. Fruit without resin-dots. Plants occurring only in Montana.
 2. R. americanum.
 - B. Leaves without resin-dots on the lower surfaces, with or without stalked glands or hairs.
 1. Leaves without hairs or stalked glands; fruit smooth, red, yellow, or black. Plants widely distributed over the lower, drier portions of the Inland Empire.
 3. R. aureum.
 2. Leaves bearing either hairs or stalked glands, or both; fruit red, or black with a whitish bloom.
 - a. Fruit red, smooth or with stalked glands. Plants occurring in open, dry locations. 4. R. cereum.

b. Fruit black with a whitish bloom, bearing scattering stalked glands.

(1) Leaves without stalked glands, slightly hairy above, densely covered with white woolly matted hairs below. Rare plants, only occurring in northern Idaho... 5. R. sanguineum.

(2) Leaves bearing coarse stalked glands on both surfaces, sparsely hairy or smooth. Plants widely distributed in the forested regions, especially on burns . 6..R. viscosissimum.

II. Plants bearing spines on the stems and branches.

A. Fruit red or black, bearing scattering long-stalked glands.

1. Leaves without hairs or stalked glands; fruit black without bloom. Widely distributed over the Inland Empire.7.R. lacustre.

2. Leaves hairy and with stalked glands on both surfaces; fruit red. Plants occurring only at high elevations in arid localities. 8. R. montigenum.

B. Fruit black or purple without bloom, without stalked glands.

1. Leaves bearing very fine stalked glands at least on the lower surfaces, and hairy, more so on the lower than upper surfaces; young stems and branches finely hairy.

a. One-year-old stems light gray to yellowish, old stems slightly if at all bristly between the nodes. Plants of general distribution.

9. G. irrigua.

b. One-year-old stems reddish brown to grayish-brown; old stems often densely bristly between the nodes.

(1) Persistent flowers hairy. Plants of eastern Washington and extreme western Idaho. 10. G. cognata.

(2) Persistent flowers without hairs. Plants of Montana and extreme eastern Idaho. 11. G. setosa.

2. Leaves smooth or sparsely hairy, but not glandular; young stems without hairs.

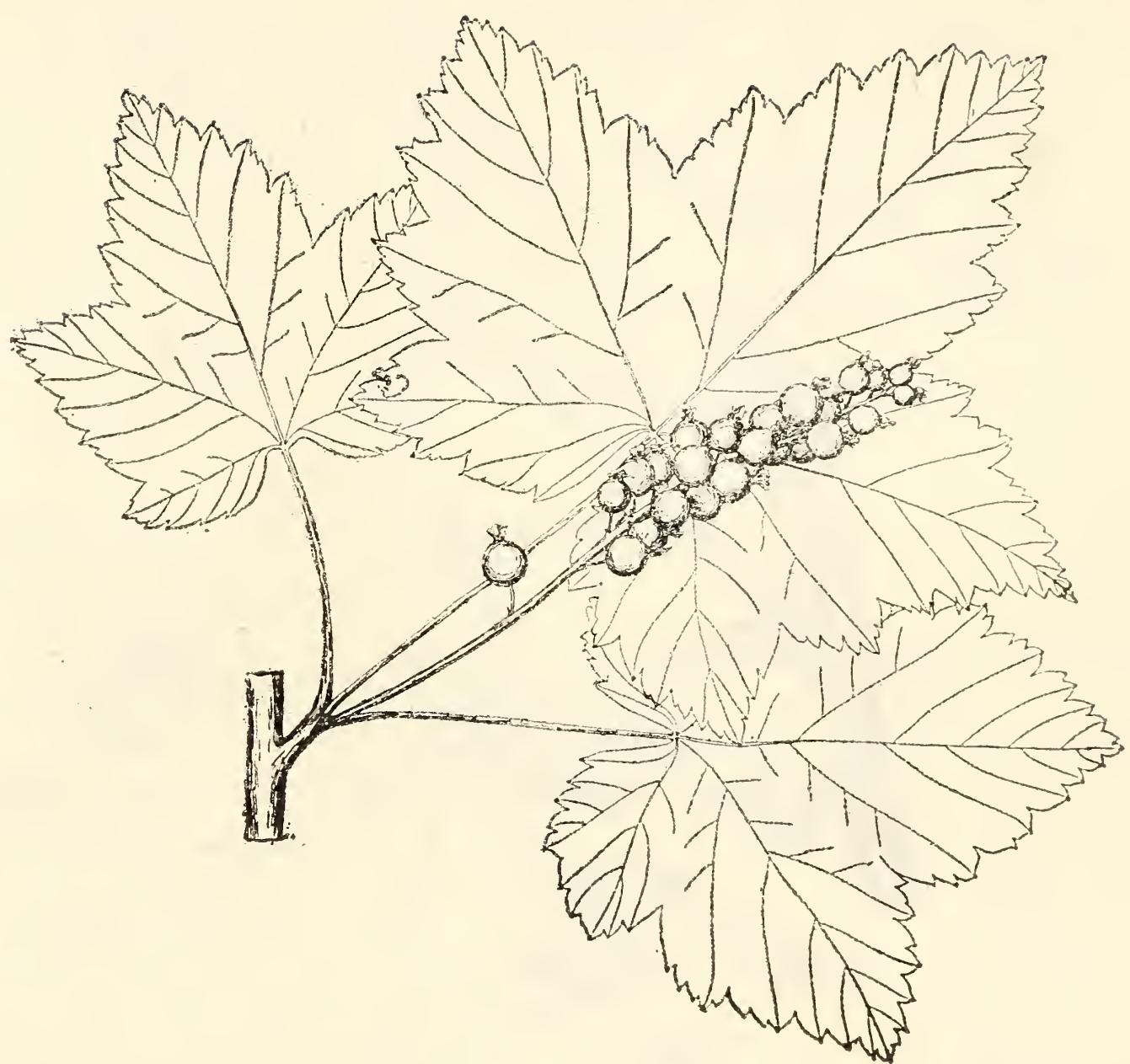
a. One-year-old stems dark reddish-brown; nodal spines strong, stout. Plants occurring only in the west central part of the Inland Empire. 12. G. nivea

b. One-year-old stems white to yellowish; nodal spines few, weak, often wanting. Plants of wide and general distribution . . . 13. G. inermis.

1. RIBES PETIOLARE DOUGL.
Wild Black Currant.

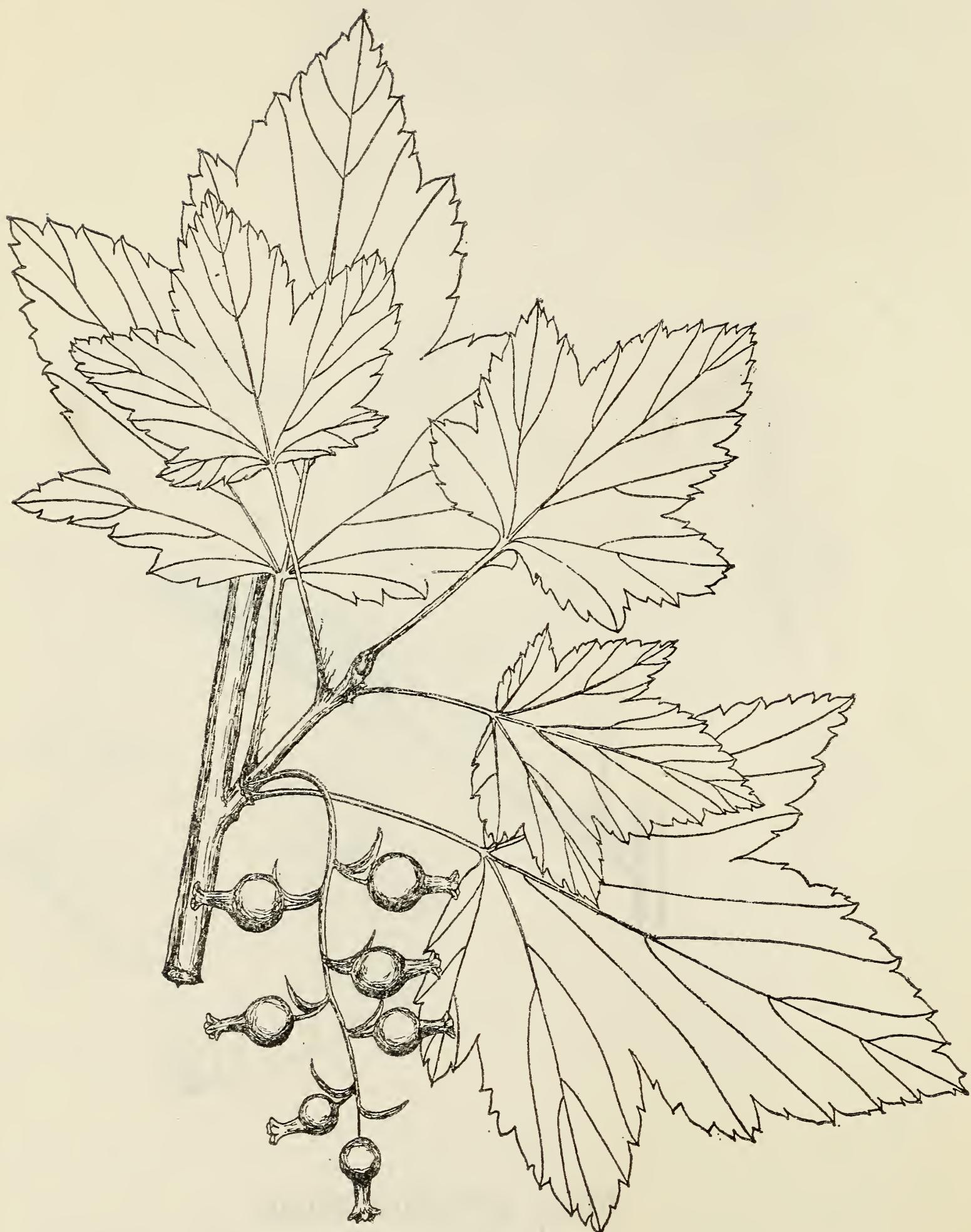
Height seldom exceeding 4 feet. Habit erect. Leaves not more than 4 inches wide, usually broader than long, deeply heart-shaped at the base, resin-dotted beneath

6-a



Ribes petiolare Dougl.
(1/2 Nat. size)

6-b



Ribes americanum Mill.
(4/5 Nat. size)

and occasionally hairy. Fruit-clusters at first erect, generally drooping when fruit is ripe; the numerous fruit borne close together and compactly on the fruit-stalk. Fruit black without bloom, sparsely resin-dotted. Flowers small, white, saucer-shaped.

Note: Separate *R. petiolare* from *R. americanum* by the presence of resin-dots on the fruit, and from all other currants by the presence of resin-dots on the leaves. *R. petiolare* also has a characteristic and very disagreeable odor.

HABITAT AND DISTRIBUTION. *R. petiolare* is a shade and moisture-loving plant, growing principally along streams. It is widely distributed and quite common throughout the forests of the Inland Empire.

SYNONYM: *Ribes hudsonianum petiolare* Jancz.

2. RIBES AMERICANUM MILL.

Height not exceeding 5 feet. Habit erect. Leaves not exceeding 4 inches in width, rounded, 3- or 5- lobed, widely heart-shaped to straight across or rounded at the base, lower surfaces resin-dotted and sometimes hairy, upper surfaces often but not always resin-dotted. Fruit-clusters drooping, bearing 5 to 10 fruit. Fruit black without bloom, without hairs, resin-dots, or stalked glands. Flowers yellowish-green to greenish-white, hairy, tubular.

Note: Separate *R. americanum* from *R. petiolare* by the absence of resin-dots on the fruit, and from all other currants by the presence of resin-dots on the lower leaf surfaces.

HABITAT AND DISTRIBUTION. *R. americanum* commonly grows in shade and in moist soil. It occurs only in the eastern part of the Inland Empire, east of the Bitterroot Mts., in Montana.

SYNONYM: *Ribes floridum* L'Her.

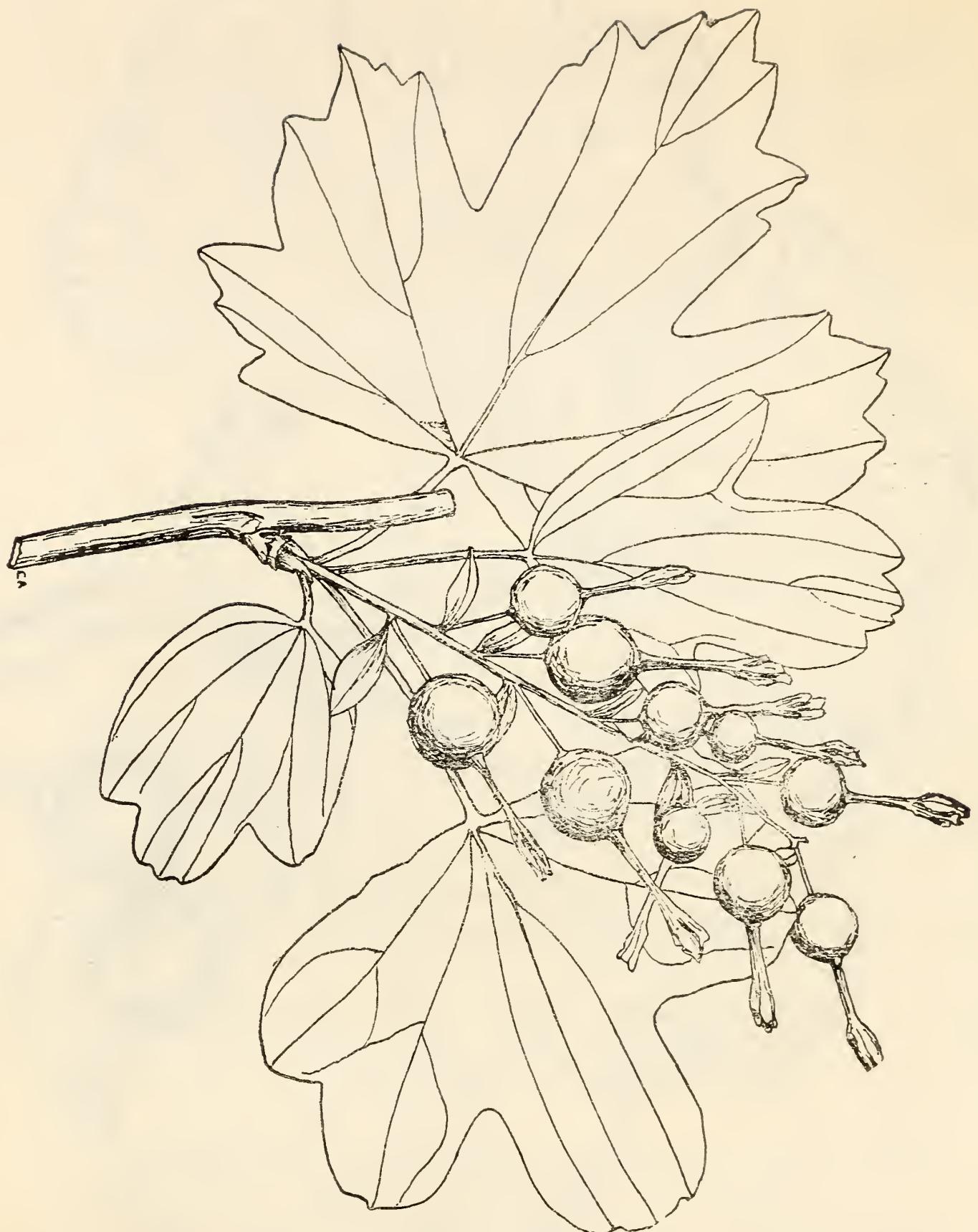
3. RIBES AUREUM PURSH
Yellow-Flowering Currant

Height 3 to 7 feet. Habit erect. Leaves not exceeding 2 inches in width, wedge-shaped at the base, 3-lobed, and only as wide as long, or straight-across to slightly heart-shaped at the base, 5-lobed, and much wider than long, with all gradations between these two shapes, both surfaces devoid of glands or hairs. Fruit-clusters rather short, 5- to 15-fruited, at least the longer ones drooping. Fruit smooth, generally deep yellow, sometimes reddish or black. Flowers long, tubular, yellow, sometimes tinged with red.

Note: Separate *R. aureum* from the two preceding species by the absence of resin-dots on the lower leaf surfaces, and from *R. cereum* by the shape of and lack of glands and hairs on the leaves.

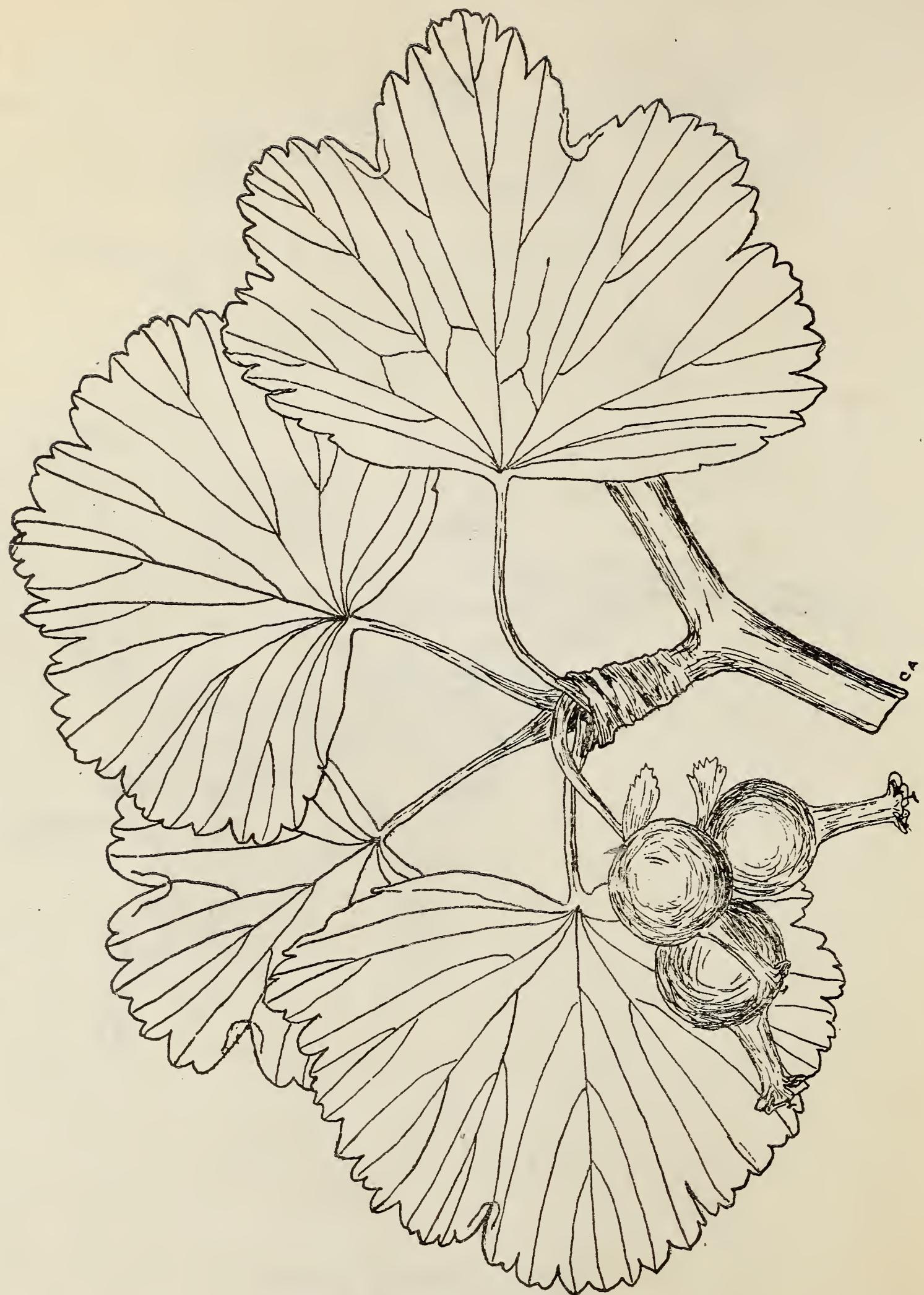
HABITAT AND DISTRIBUTION. *R. aureum* grows in open, rather arid regions, but in spots where there is considerable soil moisture and often some shade. It is widely distributed over the Inland Empire at lower elevations, particularly along the banks of streams. It is not known to occur in the white pine forests.

8-a



Ribes aureum Pursh
(Nat. size)

8-b



Ribes cereum Dougl.
(2 X Nat. size)

4. RIBES CEREUM DOUGL.
Squaw Currant.

Height seldom exceeding 4 feet. Habit erect, compact, much branched. Leaves grayish-green, not exceeding $1\frac{1}{2}$ inches in width, generally much less, usually broader than long, very shallowly 3- or 5-lobed, the lobes rounded and finely toothed, finely glandular, sometimes sticky, and often finely hairy on both surfaces. Fruit-clusters short, drooping, bearing few fruit. Fruit red, smooth or sometimes glandular. Flowers white to pink, narrowly tubular, long, hairy.

Note: Separate *R. cereum* from *R. aureum* by the shape of and presence of glands on the leaves, and from *R. sanguineum* by the color of the fruit.

HABITAT AND DISTRIBUTION. *R. cereum* is a dry land plant, generally growing in the open, often in very rocky places. It is widely distributed over the dryer portions of the Inland Empire.

SYNONYMS: *Ribes inebrians* Lindl.
Ribes reniforme Nutt.

5. RIBES SANGUINEUM PURSH
Red-Flowering Currant.

Height up to 10 feet. Habit erect but spreading. Leaves seldom more than 3 inches wide, round or somewhat longer than broad, 3- or 5-lobed, the upper surface dark green and minutely hairy, the lower surface whitish with a dense covering of white, woolly, matted hairs. Fruit-clusters drooping or erect, quite loose, bearing 10 to 15 fruit. Fruit black, covered with a whitish

bloom when ripe, sparsely covered with brownish, short-stalked glands. Flowers red, tubular.

Note: Distinguish *R. sanguineum* from *R. cereum* by the black fruit, and from *R. viscosissimum* by the lack of glands on the lower leaf surfaces.

HABITAT AND DISTRIBUTION. *R. sanguineum* generally grows in half open woods. It is a rare shrub in the Inland Empire, being only occasionally found in northern Idaho.

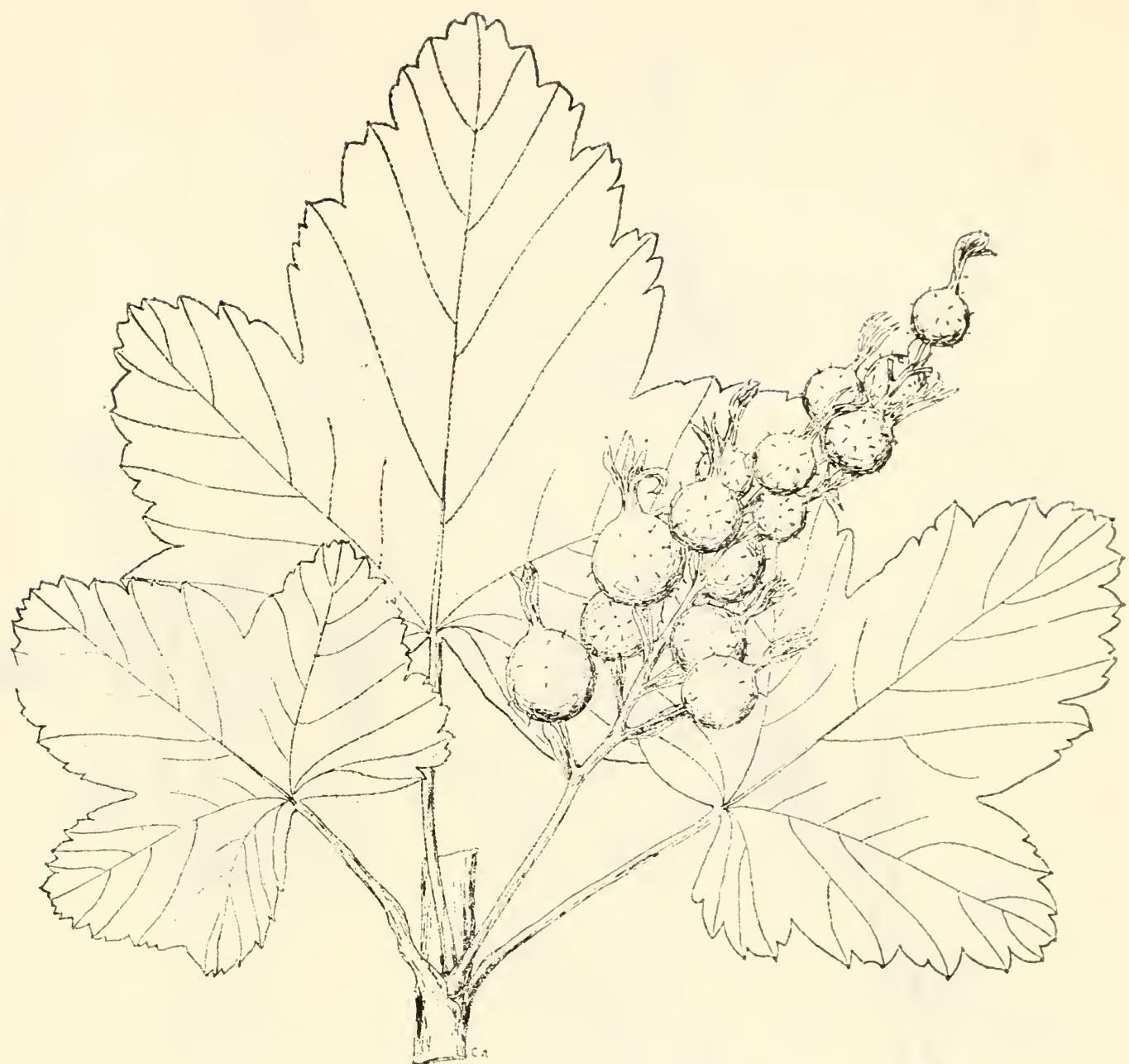
6. RIBES VISCOSSIUM PURSH Sticky Currant.

Height seldom exceeding 5 feet. Habit erect but often spreading. Leaves not exceeding 3 inches in width, round, generally 5- but sometimes only 3-lobed, the lobes broad, upper surface dark green, generally sparsely hairy, and bearing coarse stalked glands, lower surface more hairy than the upper and similarly glandular. Fruit-clusters quite short, drooping, bearing 3 to 6, or occasionally 8 fruit. Fruit black with or without bloom, oval rather than round, glandular or smooth. Flowers very light green, occasionally with a purplish tinge, broadly tubular.

Note: Distinguish *R. viscosissimum* from *R. sanguineum* by the presence of glands on the leaves, and from *R. lacustre* by the absence of spines.

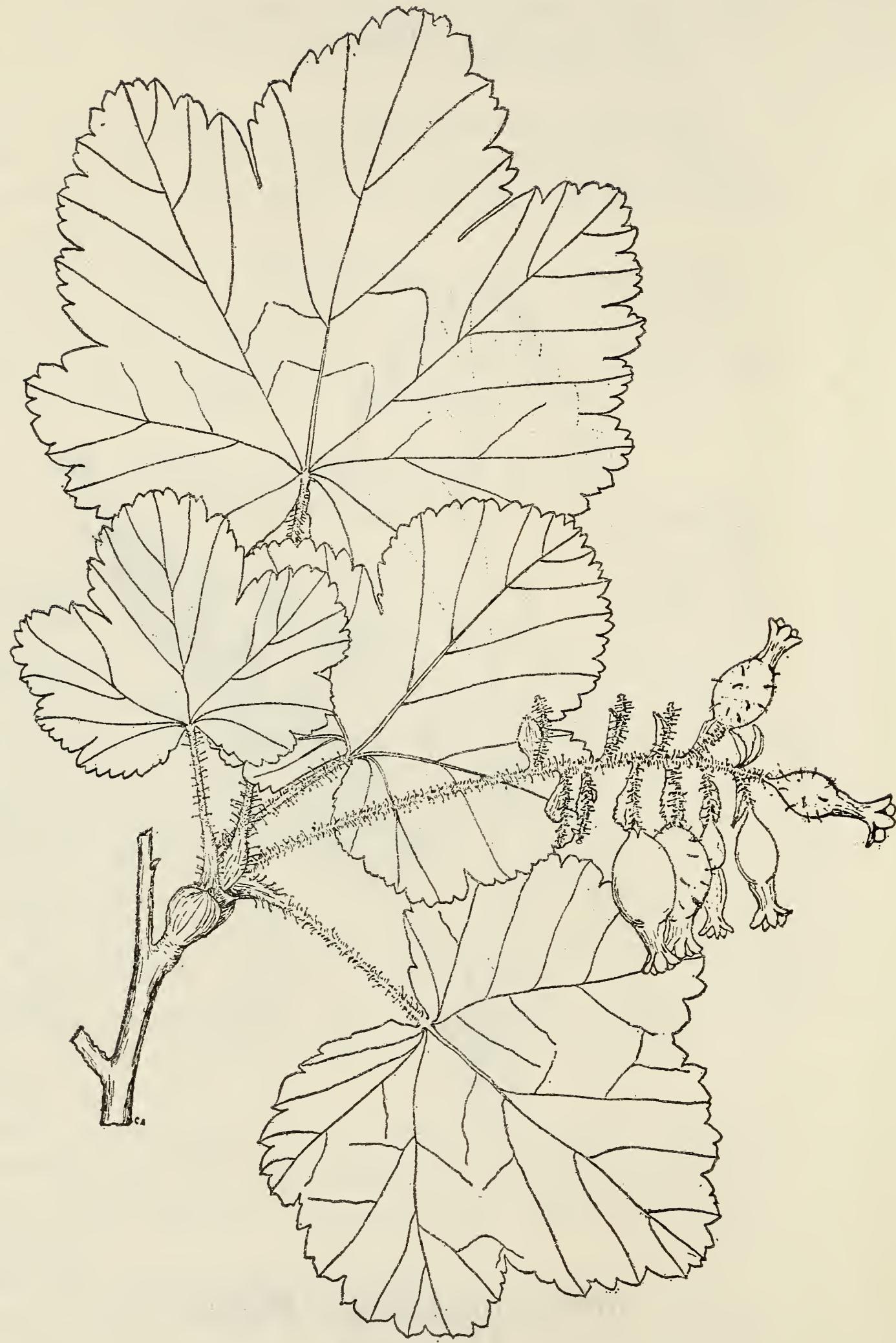
HABITAT AND DISTRIBUTION. *R. viscosissimum* is common in the yellow pine and white pine areas of the Inland Empire. It grows in partial shade or in the open, and is the first and most common species of Ribes to establish itself on burned-over areas.

10-a



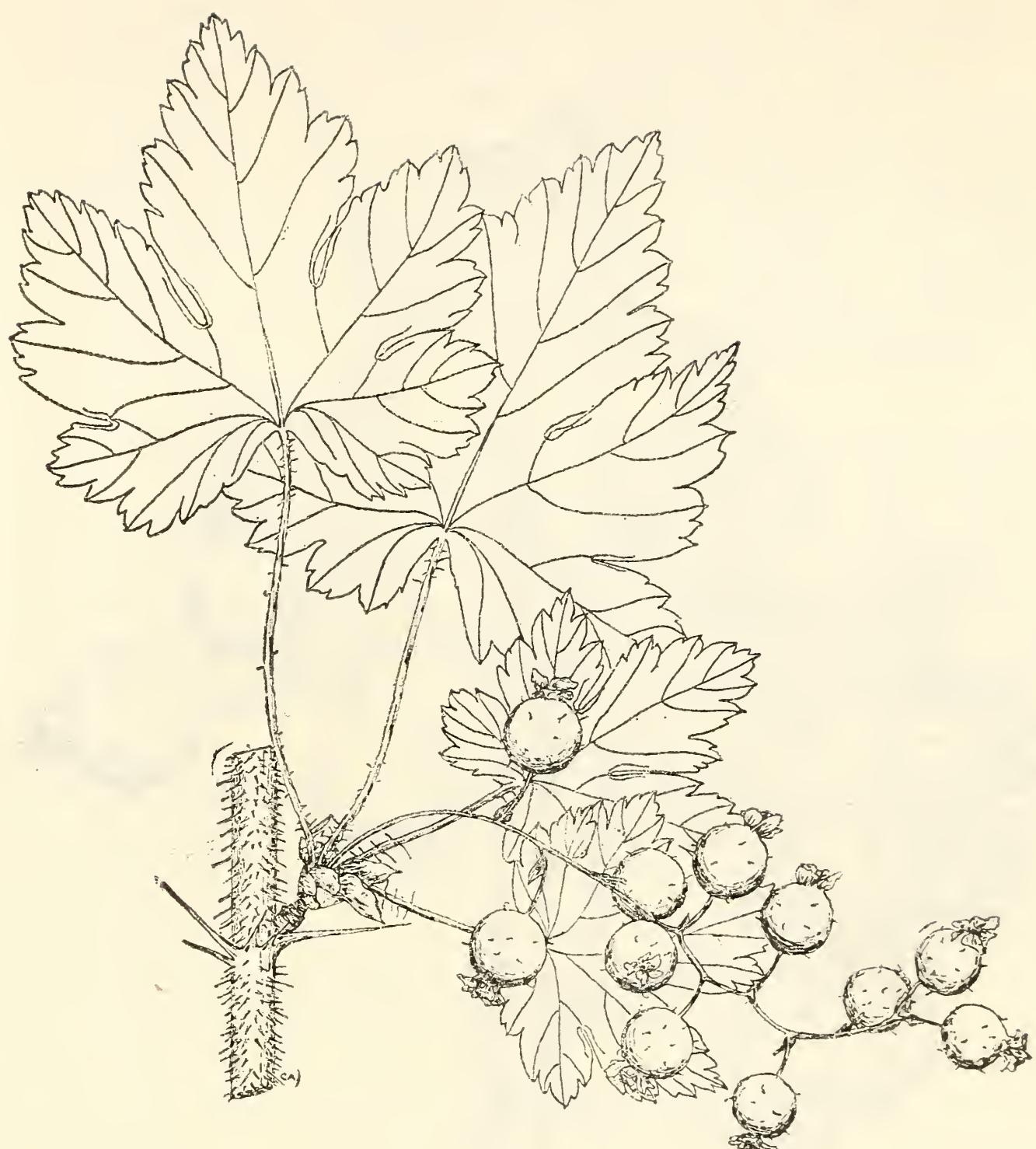
Ribes sanguineum Pursh
(Nat. size)

10-b



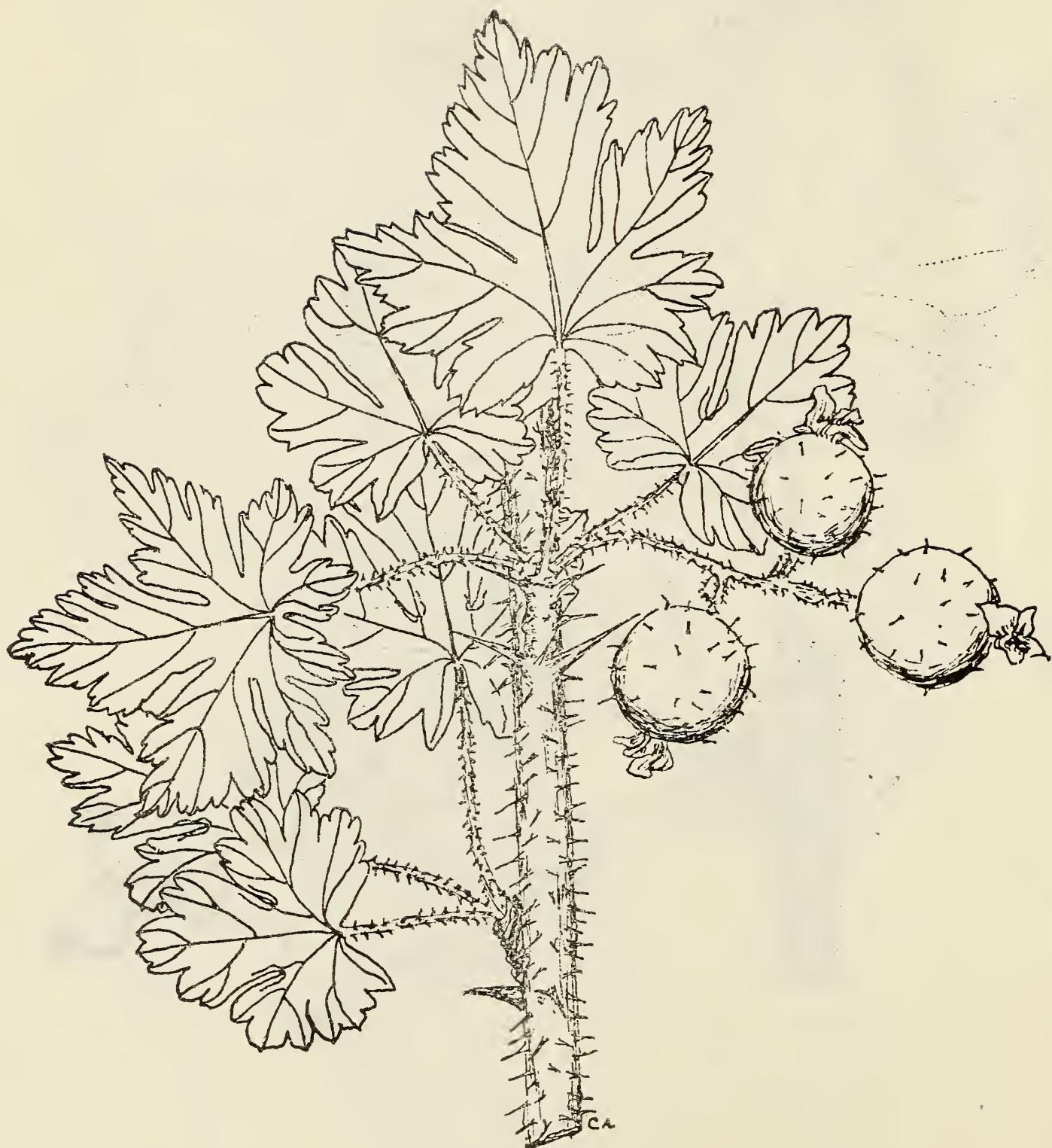
Ribes viscosissimum Pursh
(5/6 Nat. size)

10-c



Ribes lacustre (Pers.) Poir.
($1 \frac{1}{3} \times$ Nat. size)

10-d



Ribes montigenum McClatchie
(2 X Nat. size)

7. RIBES LACUSTRE (PERS.) POIR.
Prickly Currant.

Height 3 to 5 feet. Habit erect. Spines 1 to 6 at the nodes, often bristly between the nodes. Leaves seldom more than 2-1/2 inches wide, generally longer than broad, deeply 5- or 7-lobed, the lobes narrow, pointed, deeply and sharply toothed, both surfaces devoid of hairs or glands. Fruit-clusters loose, drooping, bearing 8 to 15 fruit. Fruit deep purplish-black, bearing long, weak-stalked glands. Flowers white or light green, sometimes purple-tinged, saucer-shaped.

Note: Distinguish *R. lacustre* from all preceding species of currants by the presence of spines, and from *R. montigenum* by the fruit color and the absence of hairs and glands on the leaves. Distinguish from the gooseberries by the test described on p. 3.

HABITAT AND DISTRIBUTION. *R. lacustre* is very common and widely distributed over the Inland Empire, particularly the northern part. It occurs generally in the forested region, but is not confined to any particular site condition.

8. RIBES MONTIGENUM McCLATCHIE
Alpine Prickly Currant.

Height not exceeding 3 feet. Habit straggling. Spines 1 to 6 at the nodes, occasionally bristly between the nodes. Leaves small, not exceeding 1-1/2 inches in width and generally less, very deeply 5-lobed, the margins cut into larger teeth and these in turn cut into smaller, sharp teeth,

both surfaces bearing hairs and stalked glands. Fruit-clusters loose, drooping bearing 3 to 7 fruit. Fruit red, bearing long, weak-stalked glands. Flowers small, whitish to reddish, saucer-shaped.

Note: Distinguish *R. montigenum* from *R. lacustre* by the fruit color and the presence of glands and hairs on the leaves, and from the gooseberries by the test described on p. 3, and by the fruit color.

HABITAT AND DISTRIBUTION. *R. montigenum* is confined to high elevations in the Inland Empire, often growing in rather moist places.

SYNONYM: *Ribes lenticum* Coville and Rose.

9. *GROSSULARIA IRRIGUA* (DOUGL.)

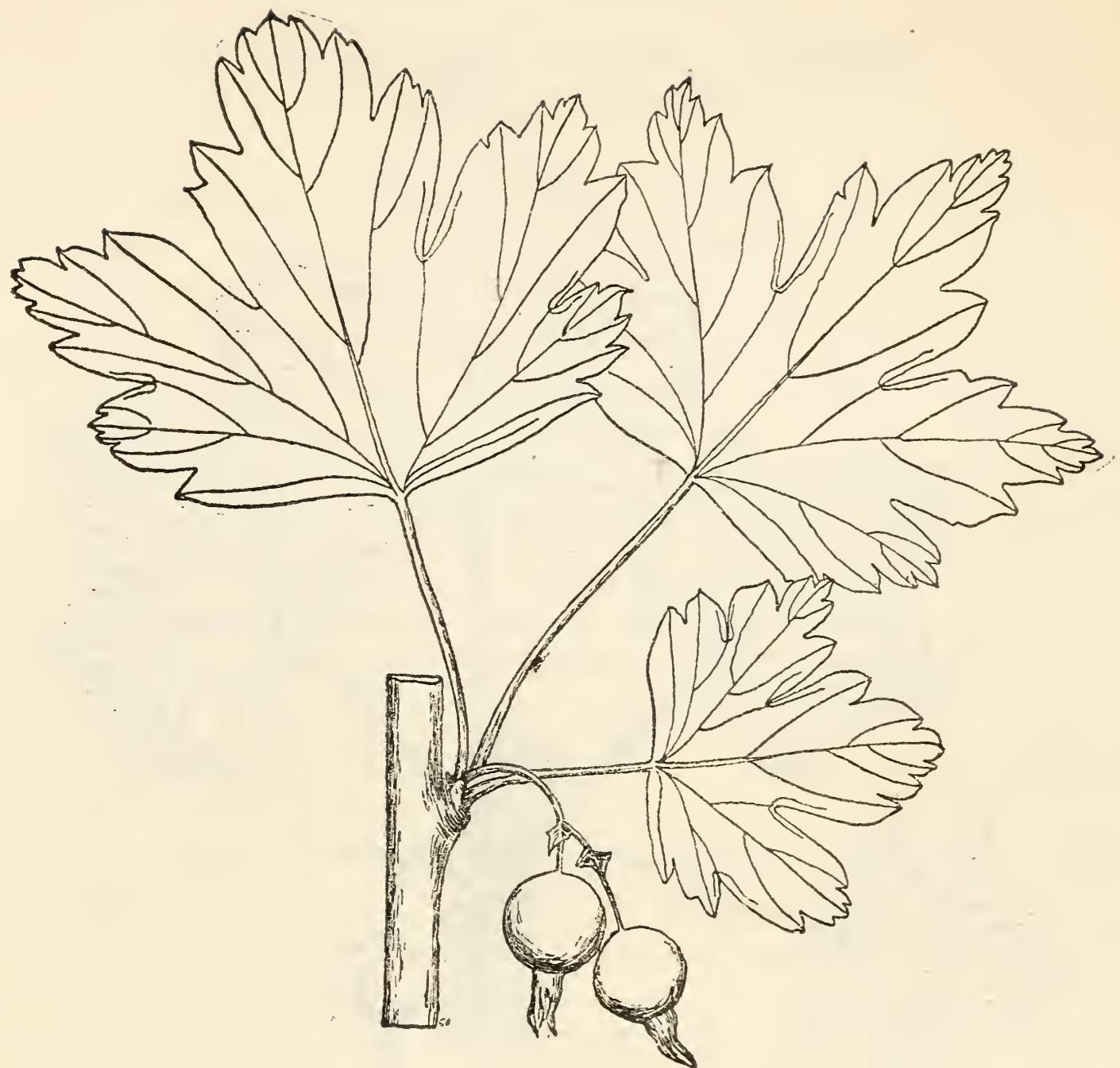
COVILLE & BRITTON

Inland Black Gooseberry.

Height 3 to 6 feet. Habit spreading. Stems gray to brown, only occasionally, slightly bristled between the nodes when old, light gray to yellowish, finely hairy and occasionally slightly bristly when young, nodal spines 1 to 3, seldom long except on young vigorous shoots. Leaves not more than $2\frac{1}{2}$ inches wide, generally less, round, mostly 5-lobed, occasionally 3-lobed when young, heart-shaped or occasionally straight across at the base, coarsely toothed, finely hairy and glandular below, generally so above. Fruit-clusters drooping, bearing 1 to 3 fruit. Fruit reddish-purple to black, smooth, devoid of hairs or glands. Flowers whitish, tubular but bell-shaped.

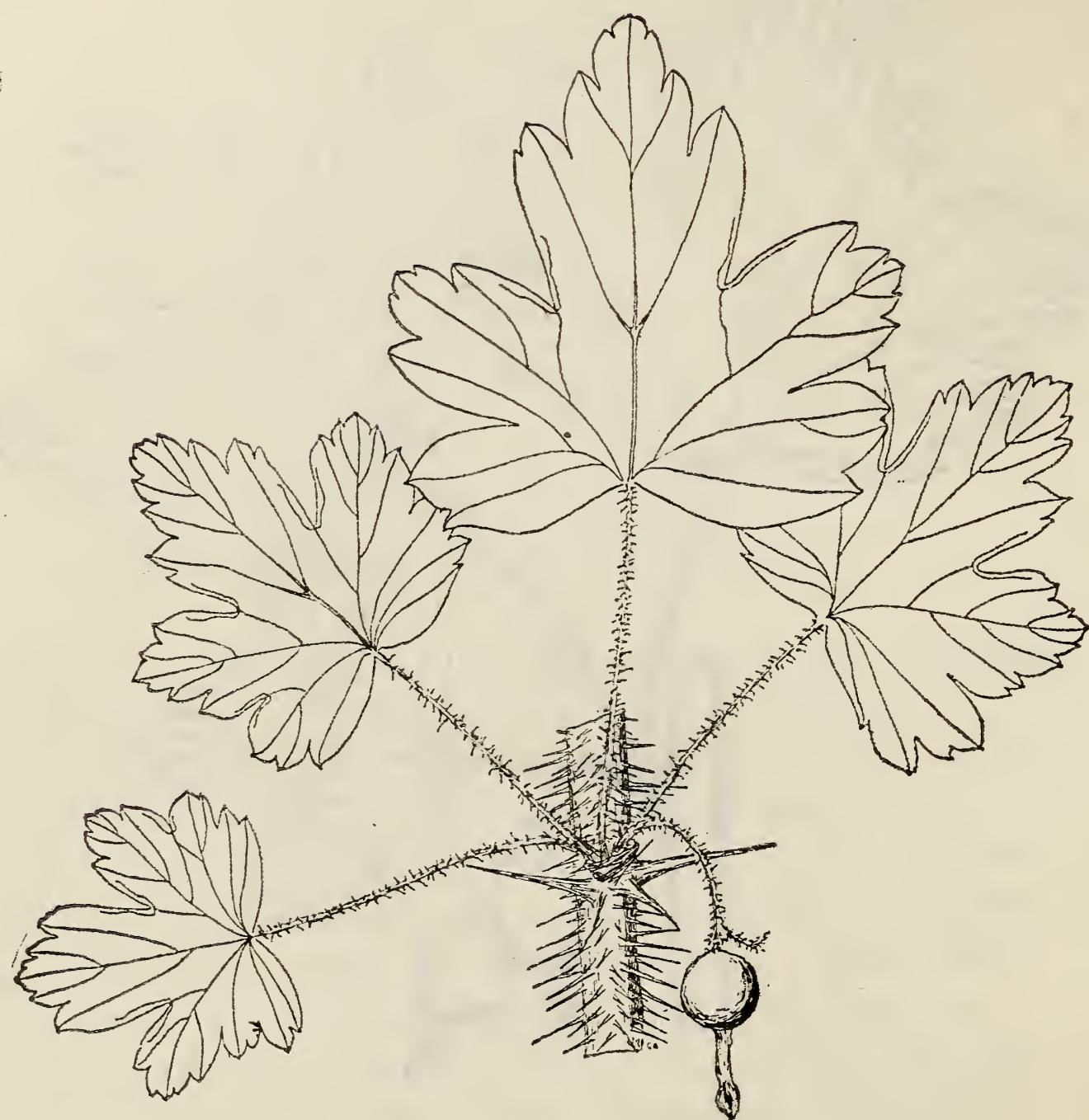
Note: Distinguish *G. irrigua* from the spiny currants by the fruit color in the case of *R. montigenum* and the presence of hairs and glands

12-a



Grossularia irrigua (Dougl.)
Coville & Britton
($1\frac{1}{4}$ X Nat. size)

12-b



Grossularia cognata (Greene)
Coville & Britton
(7/8 Nat. size)

on the leaves in the case of *R. lacustre*; distinguish from *G. cognata* by the color of the young stems.

HABITAT AND DISTRIBUTION. *G. irrigua* is quite generally distributed over the Inland Empire. It grows in either sun or shade.

10. *GROSSULARIA COGNATA* (GREENE)

COVILLE & BRITTON

Height not exceeding 6 feet, generally less. Habit erect. Stems gray to reddish-brown, generally densely bristly when old, grayish-brown to reddish-brown, hairy and generally quite bristly when young, nodal spines generally 3 in number, stout. Leaves seldom exceeding $1\frac{1}{2}$ inches in width, 5-lobed, coarsely toothed, straight across to slightly heart-shaped at the base, hairy and finely glandular below, sometimes so above. Fruit-clusters drooping, bearing 1 to 3 fruit. Fruit densely black, smooth, devoid of hairs or glands. Flowers white or pinkish, narrowly tubular, hairy.

Note: Distinguish *G. cognata* from *G. irrigua* by the color of the young stems, and from *G. setosa* by the presence of hairs on the persistent flowers.

HABITAT AND DISTRIBUTION. *G. cognata* occurs only in the extreme western part of the Inland Empire, from Spokane southward to the Blue Mountains. It grows along streams generally in partial shade.

11. *GROSSULARIA SETOSA* (LINDL.)

COVILLE & BRITTON

Bristly-Stemmed Gooseberry.

Height seldom exceeding 4 feet. Habit

erect. Stems deep reddish-brown and bristly when old, finely hairy, and sometimes lighter colored and less bristly when young, nodal spines 1 to several, quite long, generally slightly curved. Leaves seldom exceeding 2 inches in width, round, 5-lobed, coarsely toothed, heart-shaped at the base, hairy and finely glandular, especially along the veins. Fruit-clusters short, drooping, bearing 1 to 3 fruit. Fruit densely black, quite small, devoid of hairs or glands. Flowers white, occasionally yellow-tinged, long, narrowly tubular, devoid of hairs.

Note: Distinguish *G. setosa* from *G. cognata* by the absence of hairs on the persistent flowers, and from *G. nivea* by the presence of glands on the leaves and hairs on the young shoots.

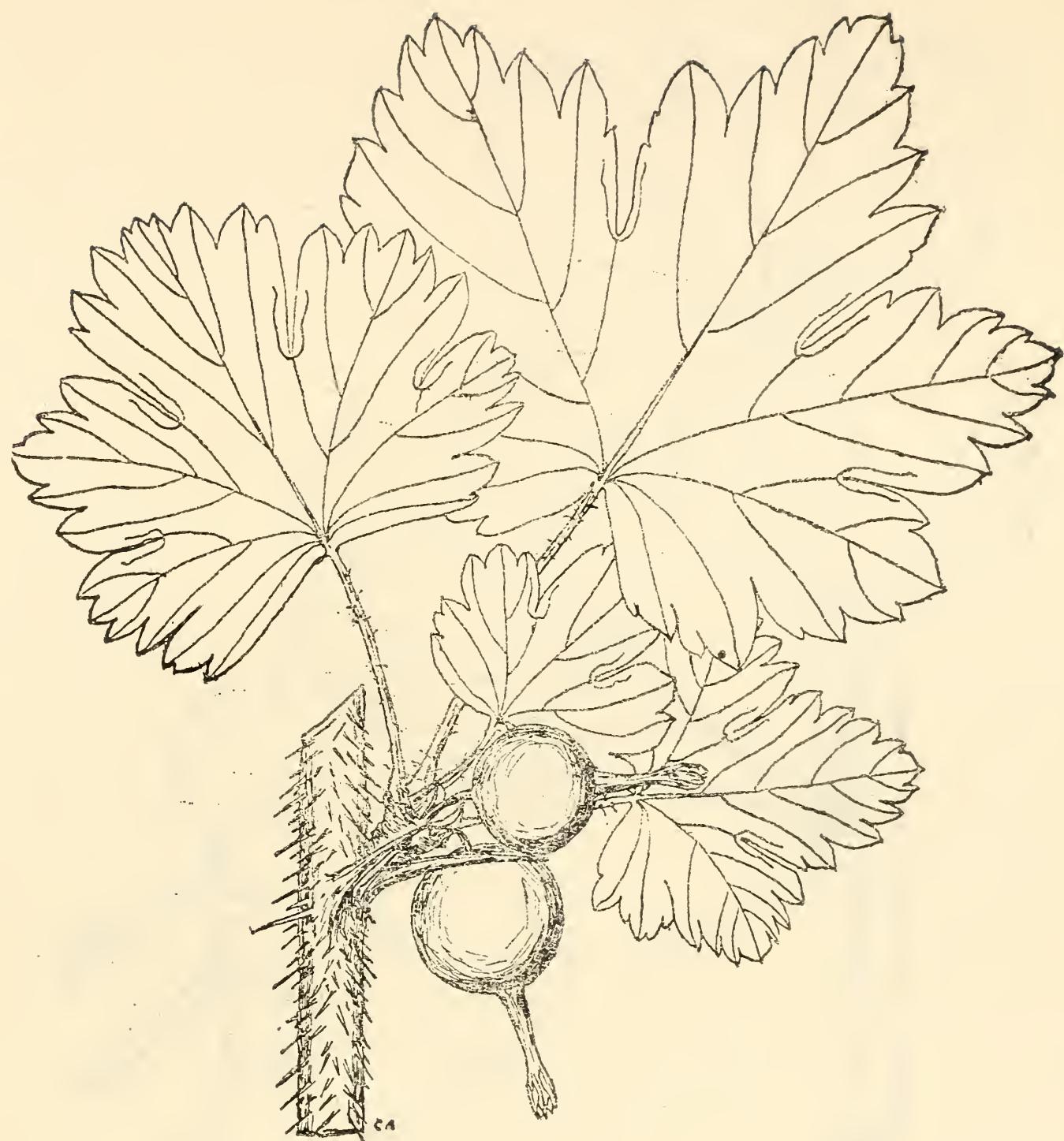
HABITAT AND DISTRIBUTION. *G. setosa* occurs only in the eastern part of the Inland Empire, in Montana and extreme eastern Idaho.

12. GROSSULARIA NIVEA (LINDL.) SPACH.

Snake River Gooseberry.

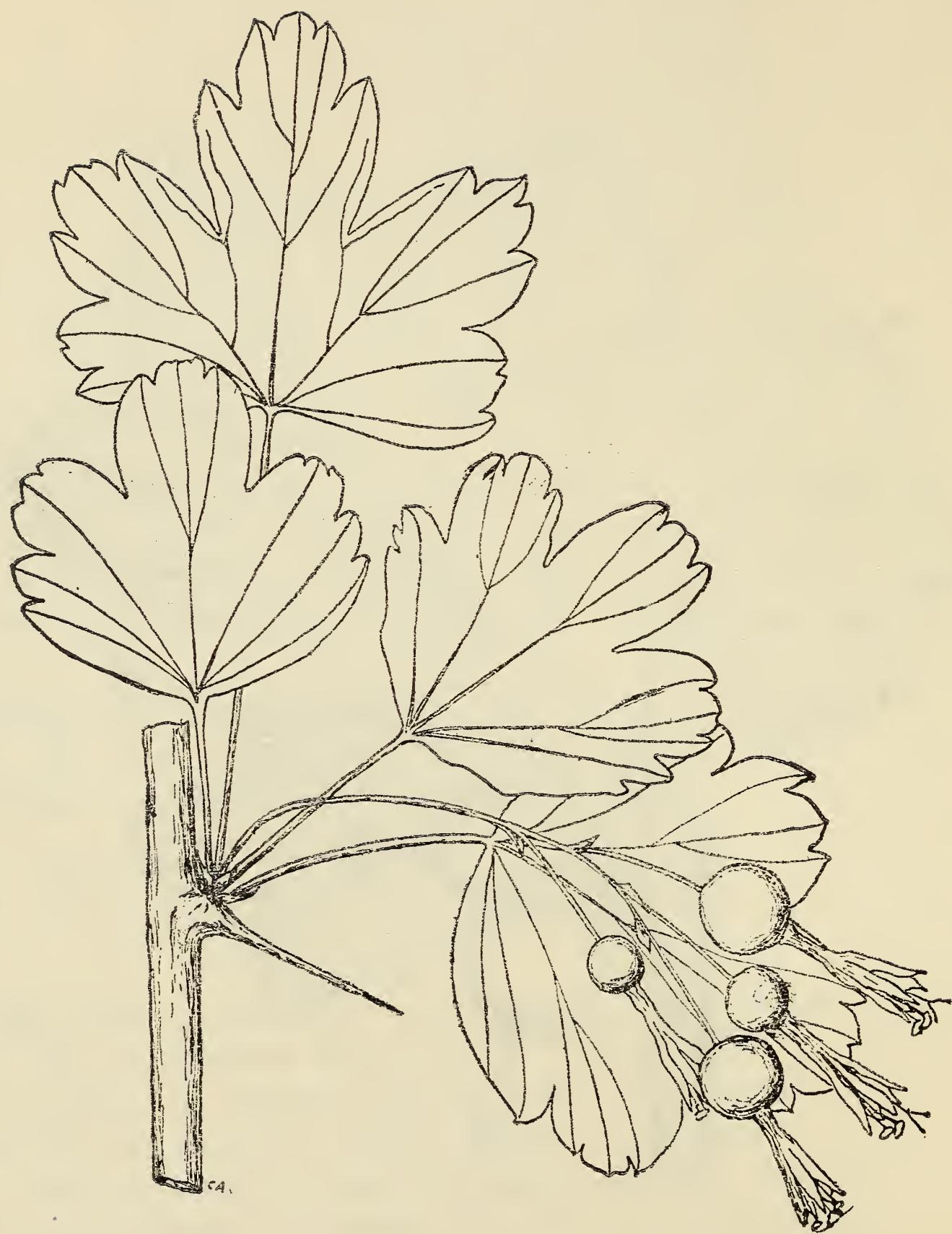
Height not exceeding 9 feet. Habit, erect at base but branches drooping. Stems deep reddish-brown or occasionally gray when old, not bristly or hairy, nodal spines generally single, occasionally 2 or 3, long, stout, stiff. Leaves very seldom exceeding 2 inches in width, round, 3- and 5-lobed, wedge-shaped to straight across at the base, the margins coarse and round-toothed, smooth above, generally hairy below. Fruit-clusters drooping, considerably longer than in the preceding three species, the fruit-stalks very slender, bearing 1 to 5 or even 6 fruit. Fruit black, devoid of hairs

14-a



Grossularia setosa (Lindl.)
Coville & Britton
($1\frac{1}{2}$ X Nat. size)

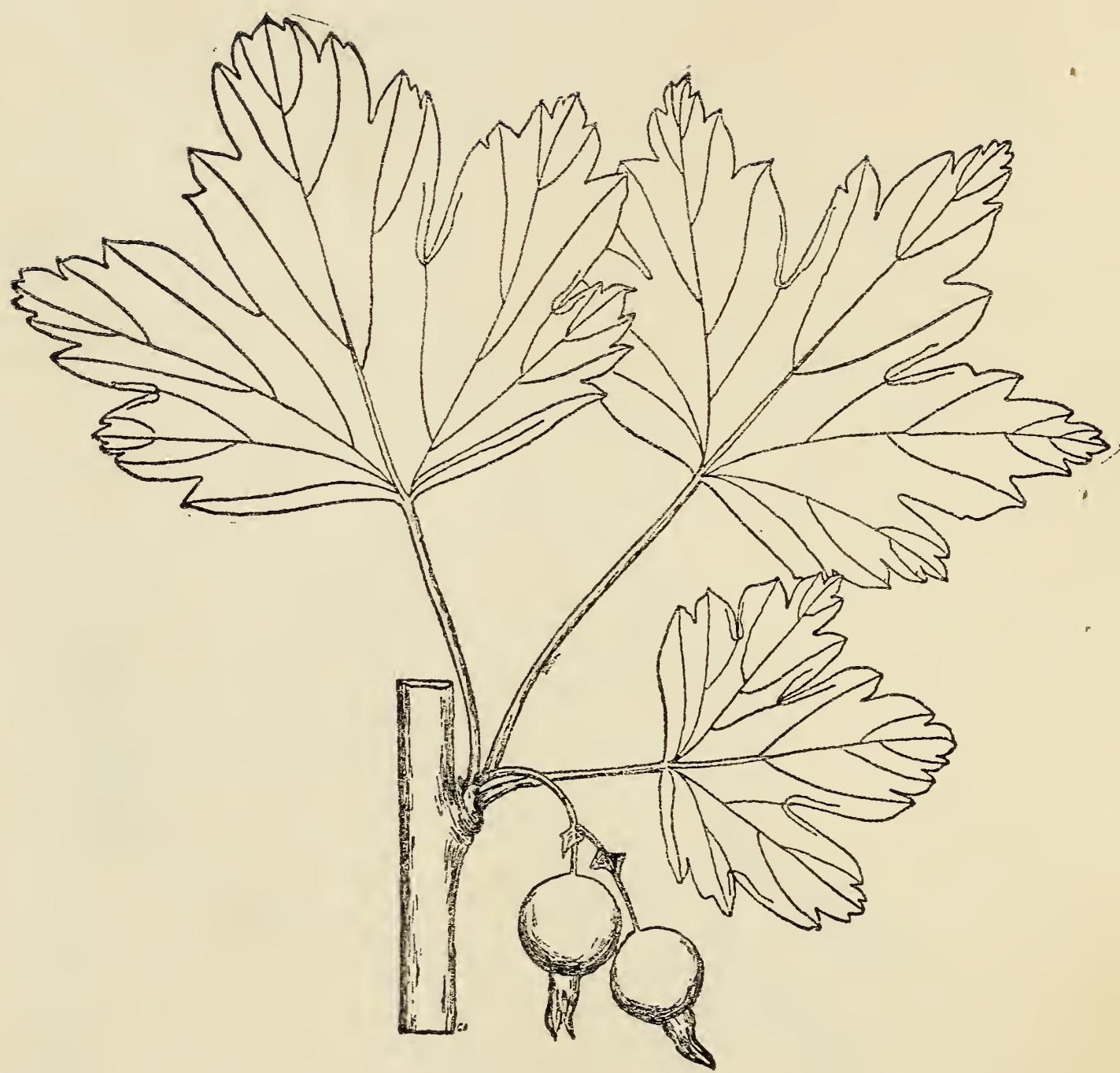
14-b



Grossularia nivea (Lindl.) Spach.

($1\frac{1}{4}$ X Nat. size)

14-c



Grossularia inermis (Rydb.)
Coville & Britton
(1 1/3 X Nat. size)

or glands. Flowers white, short-tubular with long lobes.

Note: Distinguish *G. nivea* from the preceding species of gooseberries by the absence of glands on the leaves, and from *G. inermis* by the dark-colored young stems. The long, slender fruit-stalks are of value in recognizing *G. nivea*.

HABITAT AND DISTRIBUTION. *G. nivea* occurs only in the western part of the Inland Empire, in west central and southwestern Idaho, and southeastern Washington. It grows principally along streams in dry, open places.

13. GROSSULARIA INERMIS (RYDB.)

COVILLE & BRITTON

White-Stemmed Gooseberry.

Height not exceeding 4 feet. Habit erect. Stems white or yellowish and devoid of hairs when young, the nodal spines often wanting at many of the nodes, only occasionally bristly between the nodes. Leaves seldom exceeding 2 inches in width, thin, straight across to slightly heart-shaped at the base, without glands, generally devoid of hairs but occasionally sparsely hairy. Fruit-clusters drooping, bearing 1 to 4 fruit. Fruit black or deep purplish, smooth, devoid of hairs or glands. Flowers greenish-white sometimes tinged with purple, short-tubular, rather bell-shaped.

Note: Distinguish *G. inermis* from *G. irrigua*, *G. cognata* and *G. setosa* by the absence of glands on the leaves and hairs on the young stems, and from *G. nivea* by the color of the young stems.

HABITAT AND DISTRIBUTION. *G. inermis* is widely distributed over the Inland Empire, growing in rather moist locations.

FLOWER KEY TO THE RIBES OF THE INLAND
EMPIRE

I. Plants without spines on the stems and branches.

A. Leaves with numerous yellow or reddish-brown resin-dots on the lower surfaces.

1. Flowers open, spreading, saucer-shaped, ovaries bearing resin-dots. Plants widely distributed over the Inland Empire, growing along streams. 1. R. petiolare.

2. Flowers tubular, spreading only above the tube; ovaries without resin-dots. Plants occurring only in Montana. 2. R. americanum.

B. Leaves without resin-dots on the lower surfaces; with or without stalked glands or hairs.

1. Flowers yellow, long, narrowly tubular, Plants widely distributed over the lower, drier portions of the Inland Empire. 3. R. aureum.

2. Flowers bright red, rather shortly tubular. Rare plants, only occurring in northern Idaho.

5. R. sanguineum.

3. Flowers white or greenish, occasionally tinged with pink.

a. Flowers narrowly tubular; leaves not exceeding $1\frac{1}{2}$ inches in width, grayish-green in color. Plants occurring in open, dry locations.

4. R. cereum.

b. Flowers broadly tubular, leaves larger, not exceeding 3 inches in width, deep green in color. Plants widely distributed in the forested regions, especially on burns.

6. R. viscosissimum,

II. Plants bearing spines on the stems and branches.

A. Flowers whitish to reddish, saucer-shaped, open, spreading; ovaries bearing long-stalked glands.

1. Leaves without hairs or stalked glands. Widely distributed over the Inland Empire.

7. R. lacustre.

2. Leaves hairy and glandular on both surfaces. Plants occurring only at high elevations in arid localities. S.R. montigenum.

B. Flowers whitish, tubular, spreading only above the tube.

1. Leaves bearing very fine stalked glands at least on the lower surfaces, and hairy, more so on the lower than upper surfaces; young stems and branches finely hairy.

a. One-year-old stems light gray to yellowish; old stems slightly if at all bristly between the nodes; flowers broadly tubular, bell-shaped. Plants of general distribution

9. G. irrigua

b. One-year-old stems reddish-brown to grayish-brown; old

stems often densely bristly between the nodes; flowers long, narrowly tubular.

(1) Flowers hairy. Plants of the Blue Mt. region of eastern Washington and extreme western Idaho.

10. G. cognata.

(2) Flowers without hairs.

Plants of Montana and extreme eastern Idaho

11. G. setosa.

2. Leaves smooth or sparsely hairy, but not glandular; young stems without hairs.

a. One-year-old stems dark reddish-brown; nodal spines strong, stout. Flowers white. Plants occurring only in the west central part of the Inland Empire. 12. G. nivea.

b. One-year-old stems white to yellowish; nodal spines few, weak, often wanting. Flowers greenish, occasionally purple-tinged. Plants of wide and general distribution.

13. G. inermis.

RUSTS OCCURRING ON RIBES IN THE WEST.

By Ellsworth Bethel, Pathologist,
Office of Forest Pathology.

Ribes are attacked not only by white pine blister rust but by seven other rusts, which may be found in the West. It is desirable that persons interested in blister rust be able to distinguish these various rusts on Ribes.

Rusts are themselves plants, which grow as parasites on other plants. They grow within the tissues of the host plant, and at certain seasons send out to the surface of the leaf, stem, or fruit very small reproductive bodies known as spores. These spores occur in definite pustules known as sori (singular sorus). The sorus has a thin, membranous covering known as the peridium which later ruptures to free the spores. The color of a rust sorus is determined either by the color of the peridium or of the spores, and may be white, black, orange, red, or yellow. The sori often scarcely project beyond the surface of the leaf or stem, but in other cases appear as long clustercups, or as telial horns as in white pine blister rust.

The sori, depending upon the type of spores produced, are termed pycnia (0), aecia (1), uredinia (II), and telia (III). There are also certain types of aecia recognized, as follows: an aecium whose peridium disappears early, leaving a naked pustule of spores is called a Caeoma (example, the aecial stage of *Melampsora confluens*) If the aecium is cup-shaped and the peridium toothed after breaking it is called an Aecidium. The name Peridermium is applied to certain rusts on conifers and closely related plants whose peridia split or break irregularly. Peridermums may occur on either the leaves or stems and branches. In the first case they are termed

foliicolous, meaning leaf-inhabiting, and in the second caulicolous, or stem-inhabiting. Peridermiums occurring in the branches and trunks often give rise to large hypertrophies, or galls, or "Witches' Brooms". Foliicolous Peridermiums produce Coleosporiums, while caulicolous species give rise to Cronartiums.

Six of the rusts of Ribes are heteroecious, that is, they attack two hosts, with pycnia and aecia on one host and uredinia and telia on the other. The other two rusts are autoecious, that is, they occur on only one host, having telia only.

Aeciospores of these various rusts generally appear from the middle of April to the middle of June, though the time varies with the rust, the altitude, season, and climate. For example, the aecia of *Melampsora confluens* may not be evident east of the Cascades for a month or two after they have disappeared from the cooler, more humid coast region. The uredinia and telia of *Coleosporiums* and *Cronartiums* are not likely to be found in abundance before August or September or later.

The following is a key to the rusts on Ribes which are found in the Rocky Mountains and westward.

*Heteroecious rusts with all spore forms.

I. Pycnia and aecia on leaves of Ribes.

- A. Aecia borne in clustercups which are covered by the peridium until maturity.
 - 1. Aecia short, broad, densely aggregated, yellowish to pale red.....
 -1. Puccinia Grossulariae.
 - 2. Aecia long, slender, orange-red.....
 -2. Puccinia micrantha.
- B. Aecia not borne in definite clustercups, peridium disappearing early, forming naked pustules of the caeoma type.....
 -3. Melampsora confluens.

II. Uredinia and telia on leaves of Ribes.

A. Peridium of the uredinial or telial pustule vanishing early. Uredinia appearing as large flat naked pustules, developing singly or in concentric rings, and becoming red and waxy in the telial stage.....
.....4. Coleosporium ribicola.

B. Peridium of the uredinial pustule persistent, the spores liberated through a small opening.

1. Uredinia in irregular groups of small pustules; telia appearing later as hair-like horns, giving a fuzzy aspect to the under side of the leaf.
.....5. Cronartium ribicola.
The white pine blister rust.

2. Uredinia and telia as in Cronartium ribicola and scarcely distinguishable from it. However, in regions remote from the aerial hosts - pinyon pines - will probably be found on Ribes aureum only, and not usually evident until after the first of September.
.....6. Cronartium occidentale.
The pinyon blister rust.

** Autoecious rusts having only telia.

I. Telia on leaves of Ribes.

A. Telia black, mostly hypophyllous, occurring only on Ribes lacustre.....
.....7. Puccinia Parkerae.

B. Telia, mostly epiphyllous, purplish or deep brown to black, occurring only on Ribes triste..8. Puccinia Ribis.

Note: It is extremely difficult to distinguish *Cronartium ribicola* from *Cronartium occidentale*, in the uredinial or telial stage. Any *Cronartium* which is found on *Ribes* should be potentially regarded as white pine blister rust until proved otherwise. Any blister rust scout finding such a rust should immediately report it to the man in charge of his work. Specimens of all rusts on *Ribes* should be sent to the Office of Blister Rust Control, 429 Lyon Building, Seattle, Washington.

Life Cycles of the Rusts on *Ribes*.

1. *Puccinia Grossulariae*.

I and II on leaves of *Ribes*.

III and IV on sedge (*Carex*).

2. *Puccinia micrantha*.

I and II on leaves of *Ribes*.

III and IV on rice-grass (*Oryzopsis*).

3. *Melampsora confluens*.

I and II on leaves of *Ribes*.

III and IV on leaves of willow (*Salix*).

4. *Coleosporium ribicola*.

I and II on needles of nut pines or pinyons.

III and IV on leaves of *Ribes*.

5. *Cronartium ribicola*.

I and II on stems and branches of white (5-needled) pines.

III and IV on leaves of *Ribes*.

6. *Cronartium occidentale*.

I and II on stems and branches of pinyon or nut pines.

III and IV on leaves of *Ribes*.

7. *Puccinia Parkerae.*

III on leaves of *Ribes lacustre.*

8. *Puccinia Ribis.*

III on leaves of *Ribes triste.*

